



BRACKET SYSTEM AND METHOD FOR USE WITH
REMOTE-READING WATER METERS

Background of the Invention

1. Field of the Invention

This invention relates to remote-reading water meters, and more particularly relates to the mounting of an antenna/transponder unit within a meter box.

2. Description of the Related Art

A typical conventional remote-reading water meter has an antenna/transponder unit which is installed in a meter box below the box lid. After a quantity of water flows through the meter, water consumption data is transmitted by radio frequency (RF) signals generated by the antenna/transponder. Registers in the meters have a multilobe cam on a shaft which rotates as water passes through. A piezoelectric switch generates an electric pulse as each cam lobe passes by. The number of pulses are totaled in the register, both by advancing the human-readable meter dials in the normal manner and by storing the data in the meter's electronic memory cache. The remote receiver can be periodically actuated to send out a coded signal that turns on a transmitter in the transponder of a nearby meter. The transponder responds to the coded signal by generating the RF signals which contain the stored data.

The antenna of a conventional remote-reading meter is directional and radiates the RF signals in a relatively narrow beam. The beam is directed at an upward angle from horizontal. The angle is selected to be optimum for reaching any nearby above-ground receiver that can pick up the signals. In certain areas there can be a human meter reader carrying a hand-held receiver that picks up the RF signals for recording the data from individual meters. Other areas can use mobile receivers in vehicles which are driven along roads in proximity to the meters for automatic pick

up of the signals.

In typical remote-reading water meters, the meter box contains a hollow tube of plastic material, such as PVC, which is mounted vertically to house the antenna/transponder. Should the meter box become flooded with water, the antenna/transponder can float to the top and exit the tube's upper end. Then after the water recedes, the antenna/transponder can float down with the water outside the pipe and come to rest on its side on the pit floor. This can result in the remote receiver being unable to pick up the RF signals because, with the antenna/transponder on its side, the beam would no longer be transmitted at the optimum angle from the horizontal and thus not reach the receiver. The remote receiving capability of the meter would then be lost, causing a disruption in collecting the data.

In addition, there exist arrangements that incorporate the antenna into the box lid. But this can lead to antenna damage or wire lead damage. Thus, when the lid is removed for servicing and then drug across a sidewalk or street the antenna can be damaged as a result of it being located at the bottom of the lid .

The need has therefore been recognized for a mounting system for use in remote-reading water meters which obviates the foregoing and other problems and disadvantages of water meters of this type. Despite the various water meter designs in the prior art, there has heretofore not been provided a suitable and attractive solution to these problems.

Objects of the Invention

It is an object of this invention to provide a new and improved system and method for mounting an antenna/transponder with a remote-reading water meter inside a meter box.

Another object is to provide a bracket system and method for use in a meter of the type described in which the antenna/transponder is mounted near the top of the

meter box at a position which is optimum for radiating RF signals along a beam to an above-ground receiver.

Another object is to provide a bracket system and method for use with water meters of the type described in which the antenna/transponders is held at in a manner preventing any water flooding within the meter box from disabling proper transmission of the RF signal beam.

Another object is to provide a bracket system and method for use with water meters of the type described in which the antenna/transponders can be easily installed or removed without the use of tools.

Another object is to provide a bracket system and method for use in mounting antenna/transponders with water meters of the type described which is inexpensive and simple to manufacture.

Brief Description of the Drawings

Fig. 1 is a side elevational view in cross section of a remote-reading water meter in a meter box shown with a bracket system incorporating a preferred embodiment of the invention.

Fig. 2 is a horizontal cross section view taken along the line 2-2 of Fig. 1.

Fig. 3 is a perspective view to an enlarged scale of the bracket system shown in Fig. 1.

Fig. 4 is a perspective view of a pair of telescoping tube beams which are components of another embodiment.

Description of the Preferred Embodiments

In the drawings Fig. 1 illustrated generally at 10 a remote-reading water meter assembly incorporating a bracket system 12 in accordance with one embodiment of

the invention.

The water meter assembly is mounted within an underground vault or pit 14. The pit is formed by a rectangular wall 16, typically of concrete, that is sunk below ground level 18. The upper end of the wall has an access opening which is formed about its perimeter by a right angle notch 19 having an inwardly facing flat ledge 20. This ledge supports a lid 22, which can also be of concrete. The lid is removable to enable access by a worker into the pit.

Water meter assembly 10 is connected with inlet and outlet water pipes 24 and 26 which emerge upwardly from the pit floor that is shown as having a gravel layer 28. These pipes connect the water pipes of the building being served with the water utility's water mains. Assembly 10 is comprised of a remote-reading water meter 30, which can be of the type described in the Description of The Related Art section above. Meter 30 is connected between the inlet/outlet pipes by angle stops 32 and 34. The meter has a metal body 35 which houses a water consumption register (not shown), the dials of which face upwardly. If required, these dials can be exposed for manual reading when the worker pivots up a lid 36.

An antenna/transponder unit 38, which can be of the type also described above in the Description of The Related Art section, is provided as a component of the remote reading meter. The antenna/transponder unit comprises a cylindrical shell 40 for housing the electronic circuit components (not shown). The circuit is coupled with the meter body and register by an insulated cable 42 which transmits electric pulses from a piezoelectric switch (also not shown) in the meter that are generated as water is consumed. Unit 38 is mounted at the upper end of shell 40 for housing an antenna (not shown) of the type that radiates RF signals in a directional or omnidirectional beam. The unit 38 may comprise a circular flat cap 44, or it could simply be circular with the same diameter as that of shell 40.

Bracket system 12 is adapted for retrofit into the pit of an existing remote-reading water meter assembly for holding its antenna/transponder unit at a position, shown

in Fig. 1, which gives optimum RF signal transmission and which maintains and secures that position indefinitely.

Bracket 12 is comprised of a pair of elongated beams 46 and 48 which are held in parallel spaced-apart position by cross braces 50 and 52. The beams and braces can advantageously be made of stainless steel for strength and corrosion resistance, or they could be made of any other material that is suitable in a water pit environment. For stainless steel, the beams and braces can be spot welded together.

The opposite ends of the beams are provided with suspension structures comprising right angles 54 and 56 which are shown as preformed as parts of the beams. As desired, the angle portions could be separate pieces secured to the beam ends. The angles comprise outwardly extending horizontally flat plates 58 and 60 and respective upwardly extending plates 62 and 64. The outwardly extending plates 58 and 60 have their outer ends spaced-apart commensurate with the distance between the vertical sides of notch 19. This enables the horizontally plates to removably seat on and be supported by ledge 20.

The lateral space length L between the facing sides of the beams (Fig. 2) is sufficiently less than the diameter D of antenna/transponder cap 44 so that the upper surfaces of the two beams provide adequate support for the antenna/transponder unit. The distance L must also be sufficiently large to enable in situ fitting of the antenna/transponder unit between the beams. This would be accomplished by manually tilting the unit at an angle from horizontal as it is moved up from below the bracket. With cap 44 tilted it can enter the space between the two beams and then be tilted back to horizontal for coming to rest with opposite diametral edges of the cap seated on top of the beams. Where the beams are made of a metal or other electrical conducting material, an insulating gasket, not shown, is fitted between the top of the beams and the cap edges.

Upwardly extending plates 62 and 64 are sized in length so that their is a

predetermined height H (Fig 3) between the top surface of horizontal section 58 and the top surface of beam 44. This top surface of the beam in turn supports and therefore defines the position of the bottom of cap 44. This height H is sufficient to hold cap 44 below the bottom surface 66 of lid 22 at the horizontal attitude and position shown in Fig. 1 where the antenna is at an optimum distance below the lid. At this distance the antenna radiates an RF signal transmission that is optimum for being picked up by a remote receiver. The height H is also sufficiently small to disable unit 38 from floating above and away from the beams in the event the pit becomes flooded with water. For these purposes height H is in the range of 0.5 inches to 2.0 inches, and preferably 1.5 inches.

With bracket 12 thereby securely and indefinitely holding cap 44 in a horizontal attitude at this height relationship, the RF signal beam direction will radiate up at an angle, in the range of 10° to 90°, from horizontal and out the meter box toward any awaiting remote receiver. The height H also brings the antenna sufficiently close to the box lid so that a significant portion of the beam escapes outwardly from between the juncture between the box lid 22 and wall 18. The invention in use has been shown to increase the normal RF transmission range of about 25' in a conventional remote-reading meter to about 150'. This increased range results in fewer missed or misread meter readings, and also enables the meter reading person or mobile unit to take the reading at a greater distance, thereby increasing versatility of the data reading operation. In addition, this antenna position is optimum for receiving signals from a remote receiver which activate the unit 38 to begin data transmissions.

In another embodiment shown in Fig. 4, each of the beams of the bracket system are comprised of a pair of sets (only one is shown) of telescoping tubes comprising tube 70 slidably interfitted about a smaller diameter tube 72. Adjacent tube of the two sets are joined by cross braces, not shown. Right angles 74 and 76 are secured as by welding to the tube distal ends. These telescoping tubes would replace the beams of the bracket system of the embodiment of Figs. 1 - 3. The telescoping tubes enable a universal bracket system which can be fitted into a range of meter box sizes. At the

installation site, the worker would need only adjust each telescoping tube set to the required length for fitment with the long inner dimension of the meter box.

While the foregoing embodiments are at present considered to be preferred it is understood that numerous variations and modifications may be made therein by those skilled in the art and it is intended to cover in the appended claims all such variations and modifications as fall within the true spirit and scope of the invention.